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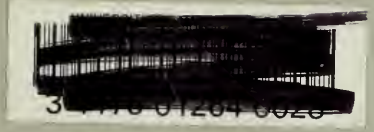

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California Water: Looking to the Future

STATISTICAL APPENDIX

Bulletin 160-87

January 1988

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CALIFORNIA WATER: LOOKING TO THE FUTURE

Bulletin 160-87

STATISTICAL APPENDIX

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JANUARY 1988

Gordon K. Van Vleck
Secretary for Resources
The Resources Agency

George Deukmejian
Governor
State of California

David N. Kennedy
Director
Department of Water Resources

MAJOR HYDROLOGIC REGIONS

CONTENTS

		Page
Population, Water Supply, and Water Use Summaries		5
Table I.	U.S. and California Population, 1980 and Projected	6
Table 2.	California Population by Hydrologic Regions, 1960 to 2010	6
Table 3.	Regional Applied Water and Net Water Use, by Type of Use	7
Table 4.	Summary of Present and Projected Net Water Use and Water Supply, by Regions	8
Net Water Use and Water Supply Balances		9
North Coast Region		11
San Francisco Bay Region		13
Central Coast Region		15
South Coast Region		17
Sacramento River Region		19
San Joaquin River Region		21
Tulare Lake Region		23
North Lahontan Region		25
South Lahontan Region		27
Colorado River Region		29
Statewide Totals		30

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POPULATION, WATER SUPPLY, AND WATER USE SUMMARIES

The tables in this *Statistical Appendix* provide supporting data for the summary tables in *California Water: Looking to the Future* (Bulletin 160-87, November 1987). Assumptions for specific sources of water supply in this *Appendix* correspond with those in the main report. These assumptions are:

State Water Project (SWP) – Additions to present facilities include the enlarged Harvey O. Banks Delta Pumping Plant, the Los Banos Grandes Reservoir, the Kern Water Bank, purchase of interim supplies from the Central Valley Project, and North and South Delta water facilities.

Central Valley Project (CVP) – Increases from 1985 to 2010 are primarily due to the San Felipe Division, the Folsom Division, the Tehama-Colusa Canal, and the Mid-Valley Canal. Excess yield is included in "Reserve Supply."

Colorado River – No surplus flows are assumed to be available in the future. Of a potential 450,000 acre-feet of water salvage in the Colorado River region, 200,000 acre-feet was unallocated. This lesser amount is shown as reserved for use in the Imperial Valley.

Waste Water Reclamation – Additions include planned projects expected to be in operation in 2010, plus an additional assumed potential of about 100,000 acre-feet from unspecified projects, for a total increase of 200,000 acre-feet per year.

Net water use values are the same as shown in the main report. They reflect the assumption that net water use by irrigated agriculture will remain level with 1980 use, except for reductions due to urban encroachment onto irrigated land in the South Coast region and to improved efficiency of use in the Colorado River region. See Chapter 2 in Bulletin 160-87 for further discussion.

Table 1

U.S. AND CALIFORNIA POPULATION, 1980 AND PROJECTED

In millions

Year	U.S.	California	California, As a Percent of U.S.
1980	227.7	23.7	10.4
1990	249.7	29.8	11.9
2000	268.2	32.9	12.3
2010	283.2	36.3	12.8

Table 2

CALIFORNIA POPULATION BY HYDROLOGIC REGIONS, 1960 to 2010

In 1,000s

REGION	1960	1970	1980	1985	2000	2010	Increase 1985 to 2010	% Increase 1985 to 2010
North Coast	315	343	456	497	611	669	172	35
San Francisco Bay	3,455	4,374	4,780	5,108	5,848	6,112	1,004	20
Central Coast	564	783	1,003	1,133	1,548	1,749	616	54
South Coast	8,550	11,014	12,906	14,148	17,447	19,106	4,958	35
Sacramento River	991	1,250	1,654	1,870	2,559	2,943	1,073	57
San Joaquin River	630	760	1,014	1,182	1,767	2,105	923	78
Tulare Lake	829	944	1,171	1,331	1,797	2,081	750	56
North Lahontan	26	40	62	69	86	99	30	43
South Lahontan	175	235	308	368	594	702	334	91
Colorado River	182	228	313	373	596	711	338	91
STATE TOTAL	**15,717**	**19,971**	**23,667**	**26,079**	**32,853**	**36,277**	**10,198**	**39**

SOURCES:

U.S. population projections: U.S. Bureau of the Census, *Population Estimates and Projections Series P-25, No. 952,* May 1984.

U.S. population estimates: U.S. Bureau of the Census, *Population Estimates and Projections Series P-25, No. 990.* (Includes armed forces overseas).

California population estimates and projections: Department of Finance, *Report 83 P-1* and *Report 85 E-2.*

Table 3. REGIONAL APPLIED WATER AND NET WATER USE, BY TYPE OF USE

1,000s of acre-feet

1980

Applied Water	NC	SF	CC	SC	SR	SJ	TL	NL	SL	CR	TOTAL
Agriculture	821	121	1,189	988	9,603	7,474	11,424	442	493	3,584	36,139
Urban	153	967	238	2,780	560	403	432	23	95	208	5,859
Wildlife and Recreation [1]	261	102	2	17	246	96	52	11	12	20	819
Energy Production [2]	0	6	0	6	0	15	3	0	2	3	35
TOTAL	1,235	1,196	1,429	3,791	10,409	7,988	11,911	476	602	3,815	42,852
Net Water Use											
Agriculture	603	121	902	794	6,895	5,934	7,948	414	337	3,397	27,345
Urban	143	967	188	2,509	460	250	236	23	61	138	4,975
Wildlife and Recreation [1]	256	96	2	17	267	74	38	11	12	20	793
Energy Production [2]	1	6	7	16	0	15	10	0	2	3	60
Conveyance Losses	33	14	0	166	0	111	89	2	7	543	965
TOTAL	1,036	1,204	1,099	3,502	7,622	6,384	8,321	450	419	4,101	34,138

1985

Applied Water	NC	SF	CC	SC	SR	SJ	TL	NL	SL	CR	TOTAL
Agriculture	832	118	1,204	895	7,803	6,923	10,680	449	349	3,658	32,911
Urban	160	1,088	269	3,118	625	436	481	27	120	249	6,573
Wildlife and Recreation [1]	338	102	2	12	268	98	53	11	21	22	927
Energy Production [2]	0	2	0	8	0	25	0	0	4	0	39
TOTAL	1,330	1,310	1,475	4,033	8,696	7,482	11,214	487	494	3,929	40,450
Net Water Use											
Agriculture	613	118	886	748	6,712	5,846	7,795	420	321	3,482	26,941
Urban	150	1,088	216	2,821	503	272	257	27	77	165	5,576
Wildlife and Recreation [1]	266	96	2	12	268	81	39	11	21	22	818
Energy Production [2]	1	2	11	26	0	25	15	0	4	0	84
Conveyance Losses	33	15	0	154	0	111	89	2	5	355	764
TOTAL	1,063	1,319	1,115	3,761	7,483	6,335	8,195	460	428	4,024	34,183

2010

Applied Water	NC	SF	CC	SC	SR	SJ	TL	NL	SL	CR	TOTAL
Agriculture	870	94	1,172	651	9,001	6,895	10,781	460	293	3,277	33,494
Urban	181	1,222	379	4,021	835	670	729	40	223	409	8,709
Wildlife and Recreation [1]	341	102	5	31	268	100	56	11	27	23	964
Energy Production [2]	0	2	0	2	2	25	0	0	26	0	57
TOTAL	1,392	1,420	1,556	4,705	10,106	7,690	11,566	511	569	3,709	43,224
Net Water Use											
Agriculture	637	94	887	570	6,878	5,929	7,926	427	268	3,120	26,736
Urban	171	1,222	307	3,591	683	383	375	40	146	270	7,188
Wildlife and Recreation [1]	280	94	5	31	268	83	42	11	27	23	864
Energy Production [2]	2	2	12	19	2	25	40	0	26	0	128
Conveyance Losses	33	20	3	154	0	111	89	2	7	284	703
TOTAL	1,123	1,432	1,214	4,365	7,831	6,531	8,472	480	474	3,697	35,619

[1] Water used on public wildlife management areas and nonurban parks.
[2] Water used for powerplant cooling and enhanced oil recovery.

Table 4

SUMMARY OF PRESENT AND PROJECTED NET WATER USE AND WATER SUPPLY, BY REGIONS

1,000s of acre-feet

YEAR	NC	SF	CC	SC	SR	SJ	TL	NL	SL	CR	TOTAL
						NET WATER USE					
1980	1,036	1,204	1,099	3,502	7,622	6,384	8,321	450	419	4,101	34,138
1985	1,063	1,319	1,115	3,761	7,483	6,335	8,195	460	428	4,024	34,183
2010	1,123	1,432	1,214	4,365	7,831	6,531	8,472	480	474	3,697	35,619
						DEPENDABLE WATER SUPPLY					
1980	1,035	1,197	866	3,396	7,499	5,959	7,332	450	316	4,037	32,087
1985	1,063	1,283	881	3,640	7,371	5,970	7,218	460	276	3,974	32,136
2010	1,123	1,425	990	4,129	7,766	5,970	7,434	480	368	3,625	33,310
						GROUND WATER OVERDRAFT					
1980	0	0	226	106	117	424	989	0	103	64	2,029
1985	0	31	221	121	112	364	977	0	152	50	2,028
2010	0	0	216	0	65	537	858	0	95	64	1,835
						SHORTAGE					
1980	1	7	7	0	6	1	0	0	0	0	22
1985	0	5	13	0	0	1	0	0	0	0	19
2010	0	7	8	236	0	24	180	0	11	8	474
						RESERVE SUPPLY					
1980	45	137	15	413	475	207	56	6	33	0	1,387
1985	31	121	15	0	588	157	0	19	0	0	931
2010	100	139	51	0	549	128	0	8	0	200	1,175

NET WATER USE AND WATER SUPPLY BALANCES

This section compares present and projected net water use with dependable water supply for each of the ten hydrologic regions. Deficiencies in supply appear in the tables as ground water overdraft or shortage. Net water use values include the effect of anticipated water conservation measures.

Following are explanations of terms that identify the types of water use and the sources of supply presented in the summary tables.

- **Irrigation, Urban, and Wildlife and Recreation Net Water Use.** The sum of evapotranspiration of applied water, irrecoverable distribution system losses, and outflow.
- **Energy Production.** Includes both powerplant cooling and enhanced oil recovery.
- **Conveyance Losses.** Water irrecoverably lost while supplies are being conveyed from the source to the area of use.
- **Local Surface Water Development.** Includes local project supplies and direct diversion of surface water, other than federal and State Water Project diversions.
- **Imports by Local Water Agencies.** Interbasin diversions (from one hydrologic region into another) by a local agency.
- **Ground Water.** Annual average recharge from natural sources, plus recharge from local reservoirs operated to augment natural stream percolation or to supply recharge basins. It does not include percolation of applied water.
- **Central Valley Project.** Increases are primarily due to the San Felipe Division, the Folsom Division, the Tehama-Colusa Canal, and the Mid-Valley Canal.
- **Other Federal Water Development.** Corps of Engineers' projects, and U.S. Bureau of Reclamation projects other than the CVP.
- **Waste Water Reclamation.** Reclaimed waste water used to meet needs that would otherwise be met by fresh water.
- **State Water Project.** Future supplies assume existing facilities, plus completion of the Delta Pumping Plant, the Los Banos Grandes Reservoir, the Kern Water Bank, and North and South Delta water facilities, and purchase of CVP interim supplies. Shortages are the differences between supplies and projected requirements.
- **Ground Water Overdraft.** Long-term excess of withdrawals over replenishment.
- **Shortage.** The difference between projected net water use and the sum of dependable supply and ground water overdraft, if any. Identified as "Source Yet to Be Determined" in the main report.
- **Reserve Supply.** Dependable surface water supply that is available but not needed at a particular time and that cannot be distributed to other areas of need because of a lack of conveyance facilities and/or institutional arrangements.

NORTH COAST REGION

NORTH COAST REGION

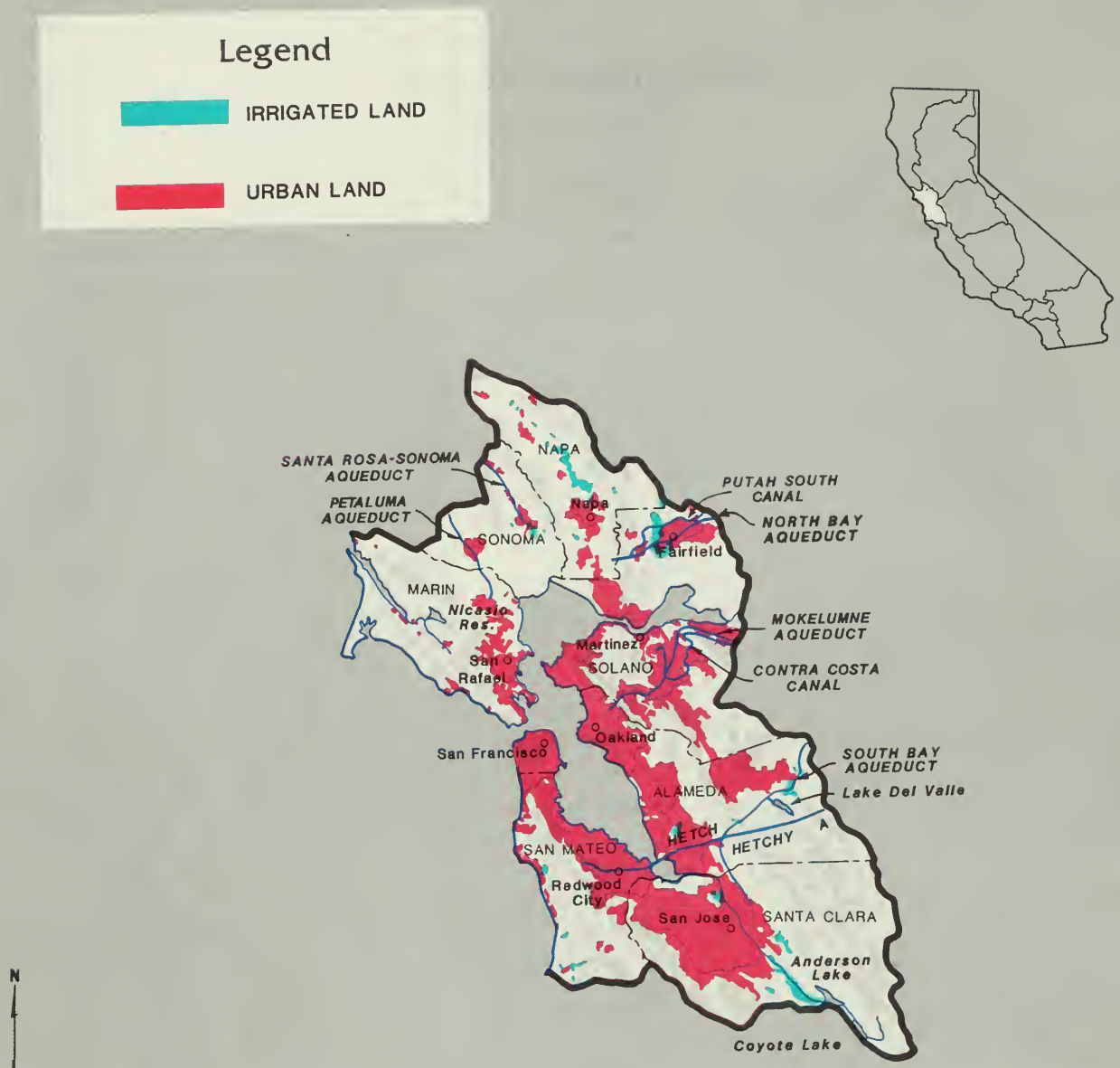
1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	603	613	637	24
Urban	143	150	171	21
Wildlife and Recreation	256	266	280	14
Energy Production	1	1	2	1
Conveyance Losses	33	33	33	0
TOTAL	1,036	1,063	1,123	60
WATER SUPPLIES				
Local Surface Water Development [1]	352	350	356	6
Imports by Local Water Agencies	18	18	18	0
Ground Water	198	226	234	8
Waste Water Reclamation	9	11	12	1
Other Federal Water Development	458	458	503	45
TOTAL	1,035	1,063	1,123	60
Ground Water Overdraft	–	–	–	–
Shortage [2]	1	0	0	0
Reserve Supply [3]	45	31	100	69

[1] Includes Ranney wells on Mad and Smith rivers.

[2] Local urban.

[3] Warm Springs Project (2010), local, and Klamath Project.



SAN FRANCISCO BAY REGION

SAN FRANCISCO BAY REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	121	118	94	-24
Urban	967	1,088	1,222	134
Wildlife and Recreation	96	96	94	-2
Energy Production	6	2	2	0
Conveyance Losses	14	15	20	5
TOTAL	1,204	1,319	1,432	113
WATER SUPPLIES				
Local Surface Water Development [1]	228	230	228	-2
Imports by Local Water Agencies [2]	472	517	549	32
Ground Water	211	233	224	-9
Central Valley Project [3]	81	95	155	60
Other Federal Water Development [4]	38	54	18	-36
State Water Project	157	144	221	77
Waste Water Reclamation	10	10	30	20
TOTAL	1,197	1,283	1,425	142
Ground Water Overdraft	0	31	0	-31
Shortage [5]	7	5	7	2
Reserve Supply [6]	137	121	139	18

[1] Includes Suisun Marsh.

[2] Mokelumne Aqueduct, Hetch Hetchy Aqueduct, Vallejo-Cache Slough, and Russian River.

[3] Contra Costa Canal and San Felipe Division.

[4] 1985 includes surplus.

[5] State Water Project service area (future).

[6] Mokelumne Aqueduct, Hetch Hetchy, and Contra Costa Canal.

CENTRAL COAST REGION

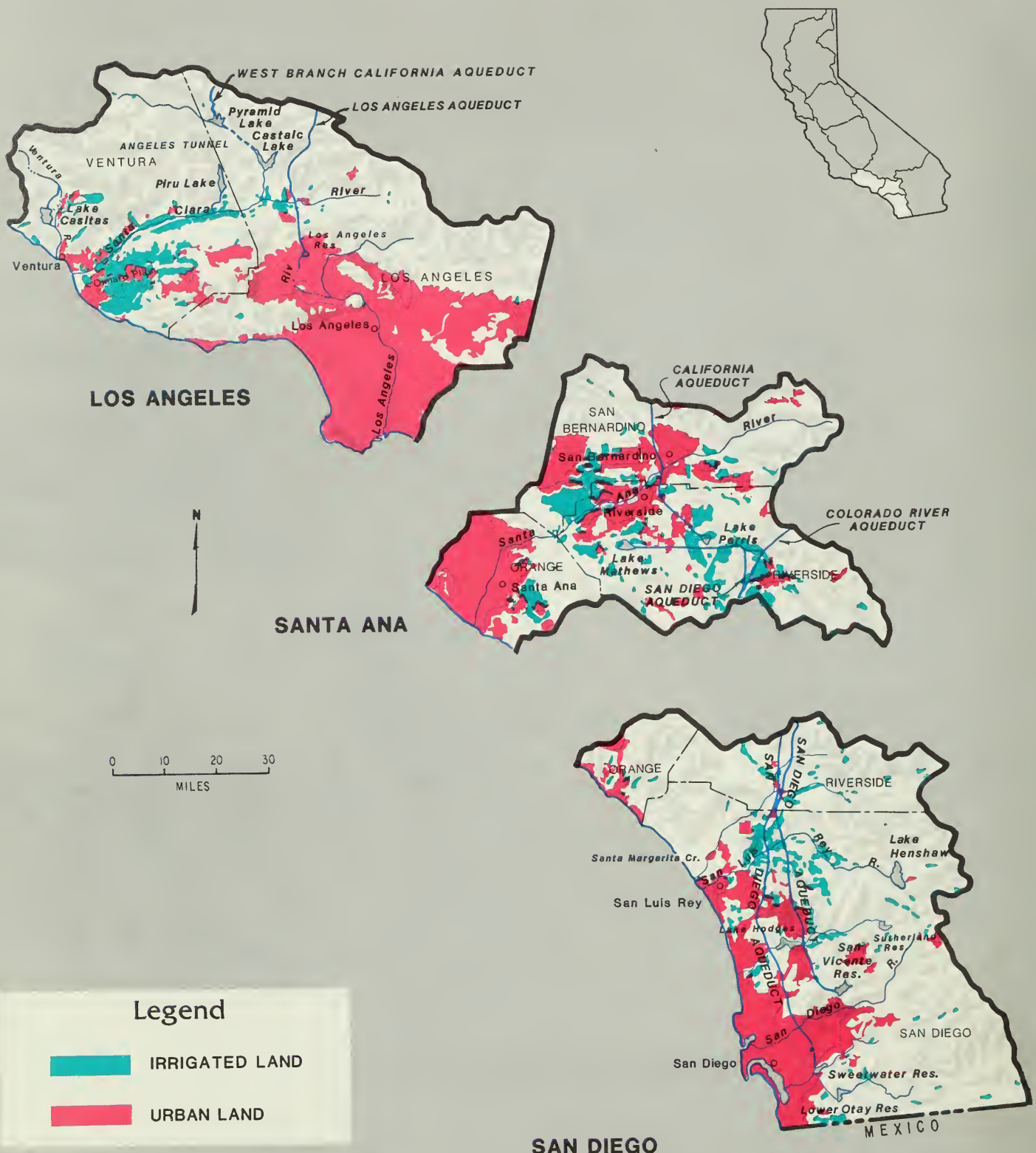
CENTRAL COAST REGION

NET WATER USE	1980	1985	2010	CHANGE 1985–2010
Irrigation	902	886	887	1
Urban	188	216	307	91
Wildlife and Recreation	2	2	5	3
Energy Production	7	11	12	1
Conveyance Losses	0	0	3	3
TOTAL	1,099	1,115	1,214	99
WATER SUPPLIES				
Local Surface Water Development	39	39	39	0
Imports by Local Water Agencies	0	0	0	0
Ground Water	768	782	746	-36
Central Valley Project [1]	0	0	82	82
Other Federal Water Development	54	54	54	0
State Water Project	0	0	63	63
Waste Water Reclamation	5	6	6	0
TOTAL	866	881	990	109
Ground Water Overdraft	226	221	216	-5
Shortage [2]	7	13	8	-5
Reserve Supply [3]	15	15	51	36

[1] San Felipe Division.

[2] Local urban 1980, 1985; SWP future.

[3] Includes Nacimiento Reservoir (15,000 acre-feet) and ground water, 2010.



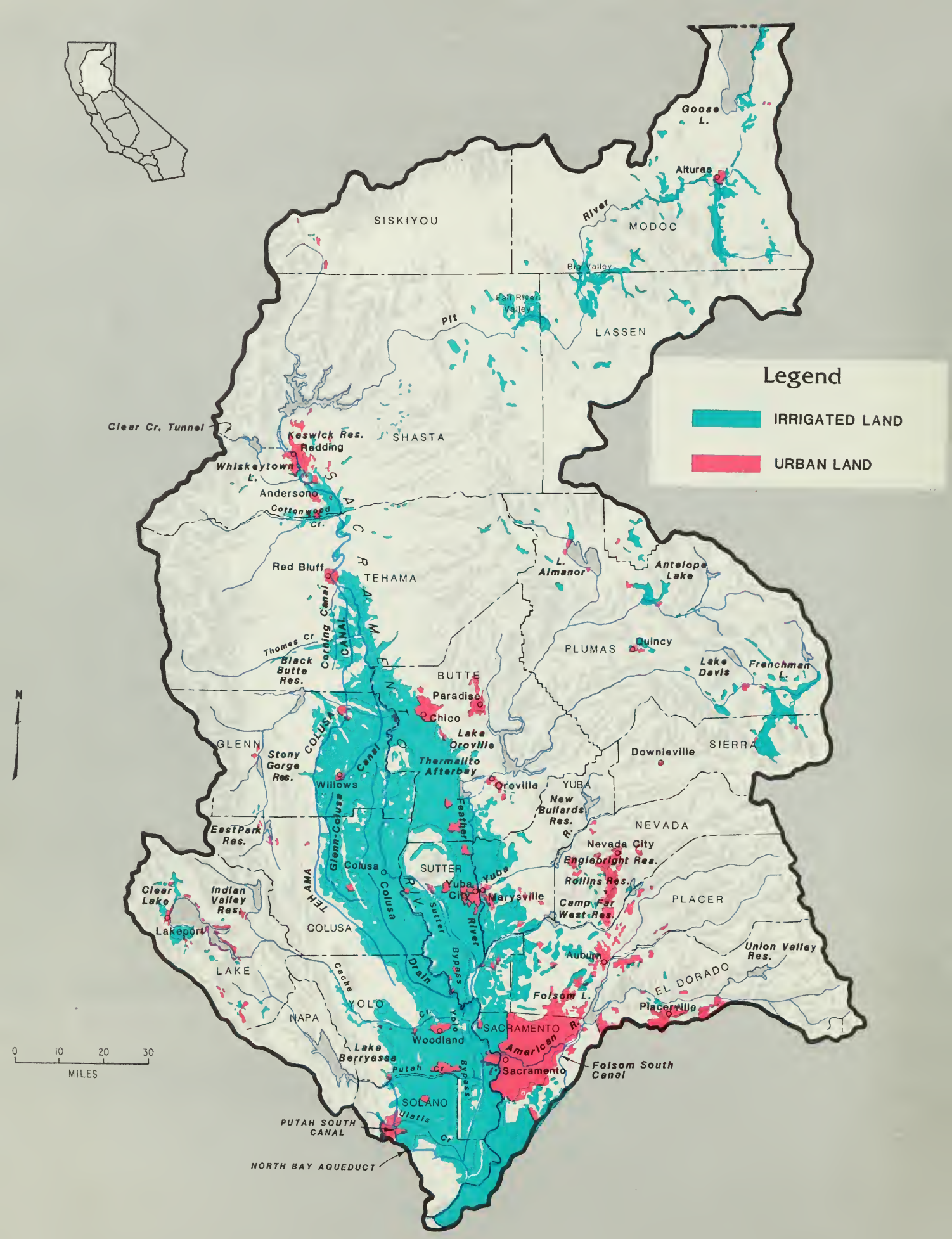
SOUTH COAST REGION

SOUTH COAST REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	794	748	570	-178
Urban	2,509	2,821	3,591	770
Wildlife and Recreation	17	12	31	19
Energy Production	16	26	19	-7
Conveyance Losses	166	154	154	0
TOTAL	3,502	3,761	4,365	604
WATER SUPPLIES				
Local Surface Water Development	159	159	159	0
Imports by Local Water Agencies	482	485	485	0
Colorado River	850	1,135	771	-364
Ground Water	962	963	963	0
Other Federal Water Development	20	20	20	0
State Water Project	840	785	1,506	721
Waste Water Reclamation	83	93	225	132
TOTAL	3,396	3,640	4,129	489
Ground Water Overdraft	106	121	0	-121
Shortage [1]	0	0	236	236
Reserve Supply [1]	413	0	0	0

[1] State Water Project.



SACRAMENTO RIVER REGION

SACRAMENTO RIVER REGION

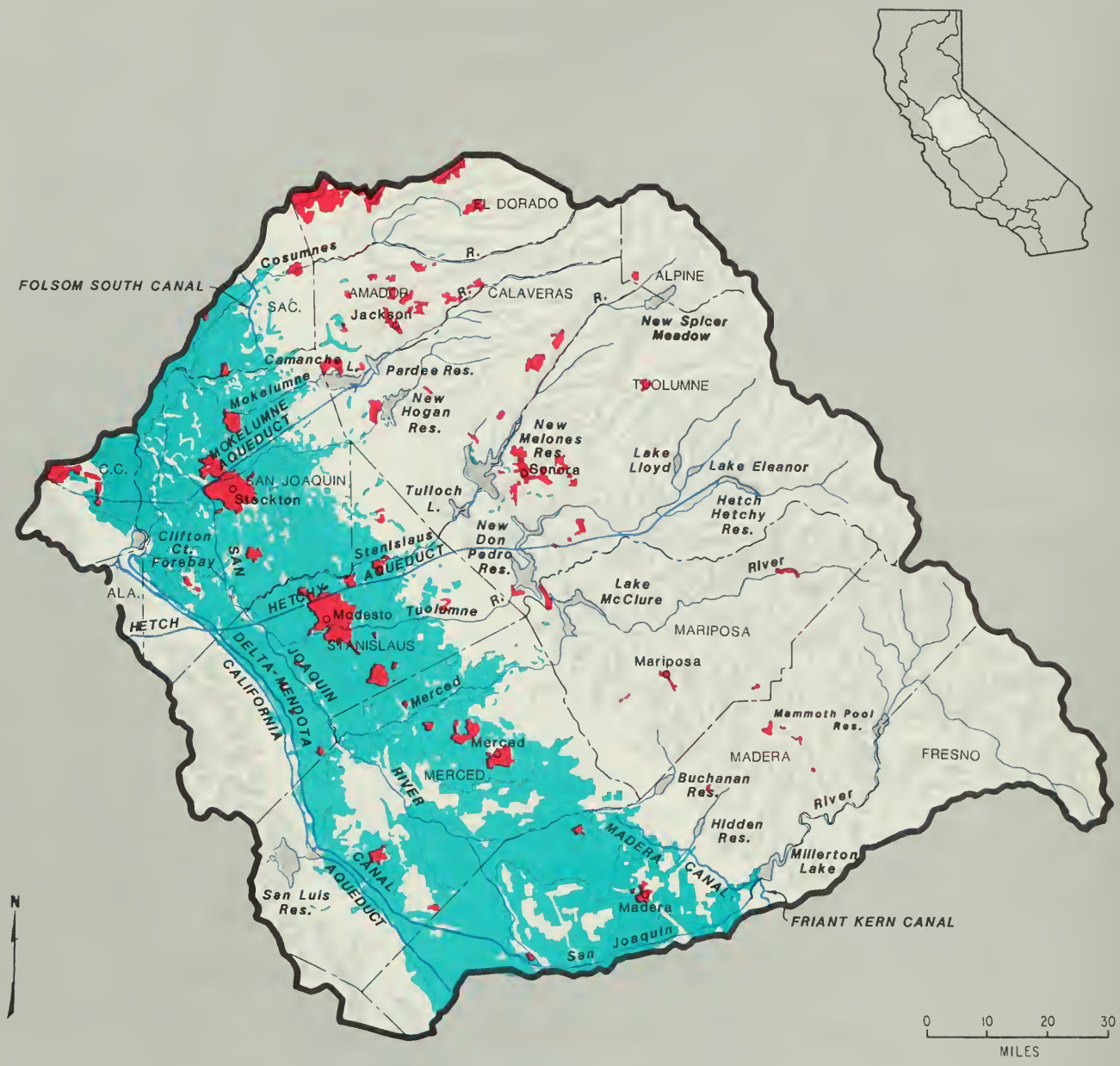
1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE 1985-2010
Irrigation	6,895	6,712	6,878	166
Urban	460	503	683	180
Wildlife and Recreation	267	268	268	0
Energy Production	0	0	2	2
TOTAL	7,622	7,483	7,831	348
WATER SUPPLIES				
Local Surface Water Development	2,877	2,864	2,896	32
Imports by Local Water Agencies	11	11	11	0
Ground Water	1,869	1,875	2,010	135
Central Valley Project [1]	2,339	2,220	2,448	228
Other Federal Water Development	380	379	369	-10
State Water Project	7	6	10	4
Waste Water Reclamation	16	16	22	6
TOTAL	7,499	7,371	7,766	395
Ground Water Overdraft	117	112	65	-47
Shortage [2]	6	0	0	0
Reserve Supply [3]	475	588	549	-39

[1] Includes Sacramento River, Tehama Colusa Canal, American River, and Folsom South Canal.

[2] Local urban.

[3] CVP and local (Placer County Water Agency, Yuba County Water Agency, and Oroville-Wyandotte Irrigation District).



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IRRIGATED LAND

URBAN LAND

SAN JOAQUIN RIVER REGION

SAN JOAQUIN RIVER REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE 1985–2010
Irrigation	5,934	5,846	5,929	83
Urban	250	272	383	111
Wildlife and Recreation	74	81	83	2
Energy Production	15	25	25	0
Conveyance Losses	111	111	111	0
TOTAL	6,384	6,335	6,531	196
WATER SUPPLIES				
Local Surface Water Development [1]	3,055	3,026	2,900	-126
Imports by Local Water Agencies	0	0	0	0
Ground Water	975	977	990	13
Central Valley Project [2]	1,845	1,882	1,986	104
Other Federal Water Development	55	55	55	0
State Water Project	8	7	5	-2
Waste Water Reclamation	21	23	34	11
TOTAL	5,959	5,970	5,970	0
Ground Water Overdraft	424	364	537	173
Shortage [3]	1	1	24	23
Reserve Supply [4]	207	157	128	-29

[1] Reduction in 2010 is the result of increased EBMUD diversions from the Mokelumne River.

[2] 2010 includes the Mid-Valley Canal.

[3] Mostly local.

[4] CVP and minor local

TULARE LAKE REGION

TULARE LAKE REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation [1]	7,948	7,795	7,926	131
Urban	236	257	375	118
Wildlife and Recreation	38	39	42	3
Energy Production	10	15	40	25
Conveyance Losses	89	89	89	0
TOTAL	8,321	8,195	8,472	277
WATER SUPPLIES				
Local Surface Water Development	2,199	2,199	2,199	0
Imports by Local Water Agencies	0	0	0	0
Ground Water	551	551	552	1
Central Valley Project [2]	2,736	2,758	3,129	371
Other Federal Water Development	243	243	243	0
State Water Project [3]	1,536	1,394	1,204	-190
Waste Water Reclamation	67	73	107	34
TOTAL	7,332	7,218	7,434	216
Ground Water Overdraft	989	977	858	-119
Shortage [4]	0	0	180	180
Reserve Supply [5]	56	0	0	0

[1] Includes loss to saline ground water (493,000 acre-feet, 1980; 493,000 acre-feet, 1985; and 476,000 acre-feet, 2010).

[2] 2010 includes Mid-Valley Canal.

[3] Includes surplus water in 1980 and 1985.

[4] State Water Project.

[5] Central Valley Project.

NORTH LAHONTAN REGION

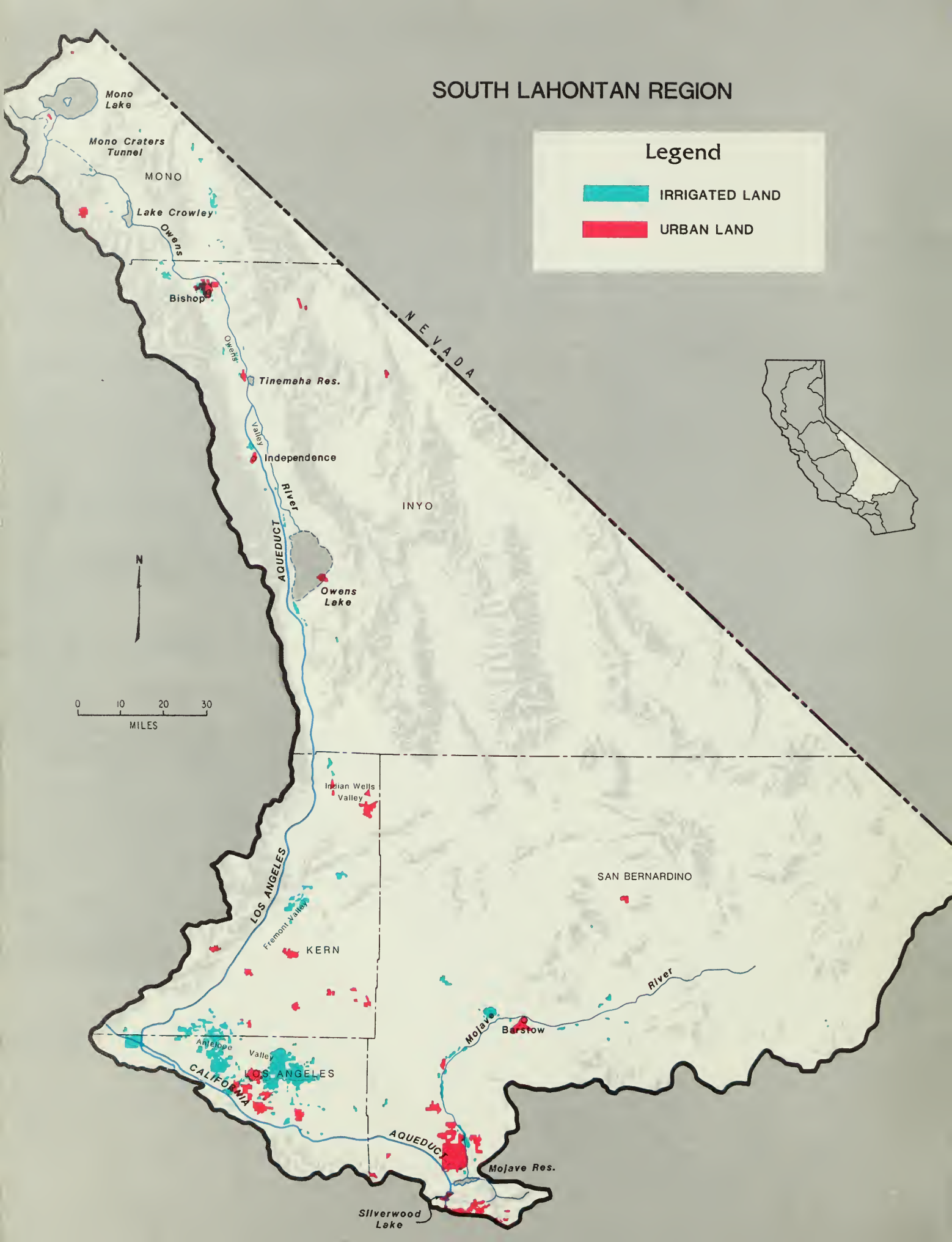
NORTH LAHONTAN REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	414	420	427	7
Urban	23	27	40	13
Wildlife and Recreation	11	11	11	0
Energy Production	0	0	0	0
Conveyance Losses	2	2	2	0
TOTAL	450	460	480	20
WATER SUPPLIES				
Local Surface Water Development	332	342	355	13
Imports by Local Water Agencies [1]	3	3	3	0
Ground Water	99	98	103	5
Other Federal Water Development	10	10	10	0
Waste Water Reclamation	6	7	9	2
TOTAL	450	460	480	20
Ground Water Overdraft	0	0	0	0
Shortage	0	0	0	0
Reserve Supply [2]	6	19	8	-11

[1] Excludes 8,000 acre-feet of evaporation at Tule Lake Reservoir.

[2] Mostly local projects, plus some from Stampede Reservoir.


SOUTH LAHONTAN REGION
Legend
IRRIGATED LAND
URBAN LAND
Mono Lake
Mono Craters Tunnel
MONO
Lake Crowley
Owens
Bishop
Owens
Tinemaha Res.
Valley
Independence
River
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Indian Wells Valley
LOS ANGELES
Fremont Valley
KERN
SAN BERNARDINO
Mojave
River
Barstow
Antelope
Valley
LOS ANGELES
CALIFORNIA
AQUEDUCT
Mojave Res.
Silverwood Lake

SOUTH LAHONTAN REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE 1985–2010
Irrigation	337	321	268	–53
Urban	61	77	146	69
Wildlife and Recreation	12	21	27	6
Energy Production	2	4	26	22
Conveyance Losses	7	5	7	2
TOTAL	419	428	474	46
WATER SUPPLIES				
Local Surface Water Development	44	44	46	2
Imports by Local Water Agencies[1]	0	0	0	0
Ground Water	178	180	169	–11
State Water Project	85	42	138	96
Waste Water Reclamation	9	10	15	5
TOTAL	316	276	368	92
Ground Water Overdraft	103	152	95	–57
Shortage [1]	0	0	11	11
Reserve Supply[1]	33	0	0	0

[1] State Water Project.

COLORADO RIVER REGION

COLORADO RIVER REGION

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	3,397	3,482	3,120	-362
Urban	138	165	270	105
Wildlife and Recreation	20	22	23	1
Energy Production	3	0	0	0
Conveyance Losses	543	355	284	-71
TOTAL	4,101	4,024	3,697	-327
WATER SUPPLIES				
Local Surface Water Development	4	4	4	0
Imports by Local Water Agencies	0	0	0	0
Colorado River [1]	3,932	3,850	3,429	-421
Ground Water	68	70	69	-1
State Water Project	30	47	62	15
Waste Water Reclamation	3	3	61	58
TOTAL	4,037	3,974	3,625	-349
Ground Water Overdraft	64	50	64	14
Shortage [2]	0	0	8	8
Reserve Supply [3]	0	0	200	200

[1] 1985 value equals 1983–1985 average; 2010 includes 30,000 acre-feet of present perfected rights.

[2] State Water Project.

[3] Imperial Irrigation District water salvage and reduced conveyance losses.

STATEWIDE TOTALS

1,000s of acre-feet

NET WATER USE	1980	1985	2010	CHANGE, 1985–2010
Irrigation	27,345	26,941	26,736	-205
Urban	4,975	5,576	7,188	1,612
Wildlife and Recreation	793	818	864	46
Energy Production	60	84	128	44
Conveyance Losses	965	764	703	-61
TOTAL	34,138	34,183	35,619	1,436
WATER SUPPLIES				
Local Surface Water Development [1]	9,289	9,257	9,182	-75
Imports by Local Water Agencies	986	1,034	1,066	32
Colorado River [2]	4,782	4,985	4,200	-785
Ground Water	5,879	5,955	6,060	105
Central Valley Project	7,001	6,955	7,800	845
Other Federal Water Development	1,258	1,273	1,272	-1
State Water Project [3]	2,663	2,425	3,209	784
Waste Water Reclamation	229	252	521	269
TOTAL	32,087	32,136	33,310	1,174
Ground Water Overdraft	2,029	2,028	1,835	-193
Shortage	22	19	474	455
Reserve Supply	1,387	931	1,175	244

[1] See San Joaquin River region for explanation of change.

[2] 1980 and 1985 include surplus deliveries; 2010 assumes no surplus flow is available, and 200,000 acre-feet of a potential 450,000 acre-feet of water salvage is reserved for future use in the Imperial Valley.

[3] 1980 and 1985 include surplus deliveries; 2010 includes Los Banos Grandes Reservoir, Kern Water Bank, enlarged Harvey O. Banks Delta Pumping Plant, purchase of CVP interim supplies, and North and South Delta water facilities.

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